

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-41

Name: Lake Mitchell

County: Davison

Legal Description: T103W- R60N-Sec 4-6, 9; T104N- R60W-Sec 31-32

Location from nearest town: Northwest side of Mitchell, SD

Dates of present survey: July 7-9, 2008 (netting)

Date last surveyed: July 9-11, 2007 (netting), June 4, 2007 (electrofishing)

Primary Game Species	Other Species
Bluegill	Channel Catfish
Black Crappie	White Crappie
Largemouth Bass	Northern Pike
Smallmouth Bass	Freshwater Drum
	Black Bullhead
	Common Carp
	White Sucker
	Shorthead Redhorse
	Walleye

PHYSICAL DATA

Surface Area: 670 acres

Watershed area: 229,911 acres

Maximum depth: 29 feet

Mean depth: 12.2 feet

Volume: 8,212 acre-feet

Shoreline length: 10 miles

Contour map available: Yes

Date mapped: 1970

Lake elevation observed during the survey: Full

Beneficial use classifications: (1) domestic water supply, (4) warmwater permanent fish propagation, (7) immersion recreation, (8) limited-contact recreation and (9) wildlife propagation and stock watering.

Introduction

Lake Mitchell was constructed in 1928 by the City of Mitchell to serve as a domestic water supply and a regional recreation center. The primary source of water is Firesteel Creek, which has two main branches and drains a watershed that extends 50 miles above the lake.

Ownership of Lake and Adjacent Shoreline Properties

Lake Mitchell is owned by the City of Mitchell. The South Dakota Department of Game, Fish, and Parks (GFP) manages the fishery. The City of Mitchell owns several public access areas and parks around the lake. The remainder of the lakeshore is privately owned and heavily developed.

Fishing Access

The West City Access Area has a double lane boat ramp, dock, parking lot, and public toilets. The Southeast City Access Area has a single lane boat ramp, dock, and parking lot. All access areas and parks provide ample shore fishing opportunities. A handicapped-accessible fishing pier is planned for the near future.

Field Observations of Water Quality and Aquatic Vegetation

The water in Lake Mitchell was fairly clear during the survey with a Secchi depth measurement of 2 m (79 in). Beds of sago pondweed (*Potamogeton pectinatus*), common cattail (*Typha spp.*), and duckweed (*Lemna spp.*) were common in the bays and creek arms. Large stands of common cattail were found in Kippes Bay and in the west end of the lake where it had been absent for several years.

BIOLOGICAL DATA

Methods:

Lake Mitchell was sampled on July 7-9, 2008 with seven overnight gill net sets and twelve overnight trap net sets. The trap nets are constructed with 19-mm-bar-mesh ($\frac{3}{4}$ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh ($\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, and 2 in) monofilament netting. Two hours of nighttime electrofishing were done on June 4 to sample the largemouth bass population. Sampling locations are displayed in Figure 4.

Gill Net Catch

Freshwater drum (26.3%), channel catfish (20.0%), and walleye (20.0%) were the most common species caught in the gill nets. The sample also included small numbers of seven other species (Table 1).

Table 1. Total catch from six overnight gill net sets at Lake Mitchell, Davison County, July 7-9, 2008.

Species	Number	Percent	CPUE ¹	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Freshwater Drum	21	26.3	3.5	<u>+1.8</u>	9.5	90	10	84
Channel Catfish	16	20.0	2.7	<u>+0.9</u>	9.6	73	20	87
Walleye	16	20.0	2.7	<u>+0.5</u>	2.1	33	0	85
Black Bullhead	9	11.3	1.5	<u>+1.0</u>	3.6	--	--	--
Northern Pike	7	8.8	1.2	<u>+1.0</u>	0.3	--	--	--
Common Carp	3	3.8	0.5	<u>+0.4</u>	1.4	--	--	--
White Sucker	3	3.8	0.5	<u>+0.4</u>	0.4	--	--	--
Black Crappie	2	2.5	0.3	<u>+0.3</u>	1.9	--	--	--
Smallmouth Buffalo	2	2.5	0.3	<u>+0.4</u>	0.0	--	--	--
Shorthead Redhorse	1	1.3	0.2	<u>+0.2</u>	7.4	--	--	--

* 10 years (1998-2007)

¹ See Appendix A for definitions of CPUE, PSD, and mean Wr.

Trap Net Catch

Channel catfish (49.1%) and bluegill (35.5%) were the most abundant species caught in the trap nets (Table 2). Eleven additional species were also sampled.

Table 2. Total catch from eighteen overnight trap net sets at Lake Mitchell, Davison County, July 7-9, 2008.

Species	Number	Percent	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Channel Catfish	439	49.1	24.4	+28.9	3.7	69	9	85
Bluegill	309	35.5	17.2	+7.6	27.0	86	13	111
Common Carp	46	5.1	2.6	+1.2	3.0	84	39	87
Shorthead Redhorse	30	3.4	1.7	+0.7	8.0	100	100	86
Black Crappie	29	3.2	1.6	+0.8	19.7	59	3	105
Freshwater Drum	13	1.5	0.7	+0.3	0.6	85	23	87
Walleye	10	1.1	0.6	+0.2	0.5	20	10	87
Smallmouth Bass	9	1.0	0.5	+0.2	0.0	--	--	--
Northern Pike	4	0.4	0.2	+0.1	0.3	--	--	--
Hybrid Sunfish	2	0.2	0.1	+0.1	0.6	--	--	--
Flathead Catfish	2	0.2	0.1	+0.1	0.0	--	--	--
White Sucker	1	0.1	0.1	+0.1	0.4	--	--	--
Green Sunfish	1	0.1	0.1	+0.1	0.1	--	--	--

* 10 years (1998-2007)

Walleye

Management objective: Establish and maintain a walleye population with a gill net CPUE of at least 5 and a growth rate of 35 cm (14 in) in three years.

Lake Mitchell contains a low-density walleye population maintained by low-level natural reproduction (Table 6). Stockings in 1993, 1995, 1997 and 1999 failed to increase walleye abundance so it was discontinued. However, due to improvements in fish marking technology, another attempt to increase walleye abundance was initiated by stocking 67,760 walleye fingerlings (1-2 in) in 2006 and 5,192 large fingerlings (8 in) in 2007. In spite of these stockings, CPUE remains below our management objective.

Table 3. Walleye gill-net CPUE, PSD, RSD-P, and mean Wr for Lake Mitchell, Davison County, 1999-2008.

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Mean*
CPUE	1.7	2.0	1.7	3.0	3.3	1.8	1.1	2.0	1.0	2.7	2.1
PSD	--	--	--	45	10	45	--	92	--	33	43
RSD-P	--	--	--	18	0	0	--	8	--	0	5
Mean Wr	--	90	--	90	85	85	--	89	--	85	87

*10 years (1998-2007)

Electrofishing on Lake Mitchell showed limited natural reproduction or recruitment of stocked walleyes in 2007 and 2008 which is consistent with past observations (Table 4). Growth of young Lake Mitchell walleyes was surprisingly fast.

Table 4. Age-0 and age-1 walleyes sampled during 2 hours of nighttime electrofishing on Lake Mitchell, Davison County, 2000-2008.

Year	Stocking	Age-0 CPH	80% C.I.	% stocked	Mean length (range; mm)	Wr	Age-1 CPH	80% C.I.	Mean length (range; mm)	Wr
2008	none	8	3-13		180 (156-211)	89	2	1-3	301 (287-305)	88
2001	none	73	33-111		187 (145-218)		2	0-3	267 (255-273)	
2000	none	21	9-33		173 (141-203)		23		230 (207-270)	

Black Crappie

Management objective: Maintain a black crappie fishery with a trap net CPUE of at least 20 and PSD of at least 40.

The summer 2007 die-off of black crappies significantly reduced abundance. Black crappie populations are cyclic, and single large year class could increase abundance to former peak levels (Table 5). The abundance objective of 20 fish/trap net set has only been reached in 5 of the last 15 years.

Table 5. Black crappie trap-net CPUE, PSD, and mean Wr for Lake Mitchell, Davison County, 1999-2008.

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Mean*
CPUE	11.0	18.2	32.6	14.5	12.0	5.4	3.8	49.5	9.3	1.6	19.7
PSD	96	2	74	39	90	95	77	3	50	59	63
RSD-P	49	0	2	3	3	27	60	0	2	3	16
Mean Wr	108	121	118	120	105	102	110	113	109	105	112

*10 years (1998-2007)

Bluegill

Management objective: Maintain a bluegill fishery with a trap net CPUE of at least 20 and RSD-18 of at least 20.

Although bluegill trap net CPUE decreased this year, it is still near the objective with excellent size structure, condition and growth (Table 6 & 7). Natural reproduction has been consistent and a large year class was produced in 2005 (Table 7 & Figure 3).

Table 6. Bluegill trap-net CPUE, PSD, RSD-18, RSD-P, and mean Wr for Lake Mitchell, Davison County, 1999-2008.

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Mean*
CPUE	23.2	13.7	35.2	36.1	31.1	6.4	19.8	53.4	39.2	17.2	27.0
PSD	91	91	99	93	99	76	52	56	87	86	84
RSD-18	87	68	86	89	67	66	39	9	29	61	63
RSD-P	71	56	23	73	57	63	30	5	3	13	44
Mean Wr	105	115	116	116	112	99	117	107	107	111	111

*10 years (1998-2007)

Table 7. Average back-calculated lengths (mm) for each age class of bluegill in Lake Mitchell, Davison County, 2008.

Year Class	Age	N	Back-calculation Age							
			1	2	3	4	5	6	7	8
2007	1	20	60							
2006	2	44	59	133						
2005	3	160	46	111	170					
2004	4	64	50	106	173	190				
2003	5	21	46	92	130	157	187			
All Classes		309	52	110	158	174	187			
Statewide Mean			55	103	141	166	180			
Region III Mean			60	116	157	180	190			
LLI Mean			62	109	149	173	180			

All Fish Species

Shorthead redhorse gill-net CPUE has declined substantially from its 10 -year high in 2003 and black crappie trap-net CPUE was at an all time low. Channel catfish trap-net CPUE was at a record high. The CPUE for all other species was within previously observed ranges (Table 11). Lake Mitchell has a diverse fish community with 14 species sampled this year and 21 species sampled in the past ten years (Table 11).

Table 8. Gill-net (GN) or trap-net (TN) CPUE for all fish species sampled in Lake Mitchell, Davison County, 1999-2008.

Species	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
BIB (GN)	0.3	--	--	0.2	1.0	--	--	--	--	--
BIB (TN)	0.1	--	--	--	--	--	0.1	--	0.2	--
BLB (GN)	12.5	19.6	2.3	0.3	--	0.3	--	--	0.3	1.5
BLB (TN)	4.6	7.1	1.2	0.4	0.2	--	0.2	0.7	--	--
BLC (GN)	0.2	1.2	6.7	0.5	2.7	0.3	0.5	5.2	0.4	0.3
BLC (TN)	11.0	18.2	32.6	14.5	12.0	5.4	3.8	49.5	9.3	1.6
BLG (GN)	--	0.2	0.7	0.3	0.7	0.8	0.9	0.8	--	--
BLG (TN)	23.2	13.7	35.2	36.1	31.1	6.4	19.8	53.4	39.2	17.2
CCF (GN)	10.2	19.0	19.0	7.3	15.0	3.3	5.3	4.3	6.0	2.7
CCF (TN)	0.7	2.1	4.9	2.4	16.8	3.9	3.2	1.5	1.2	24.4
COC (GN)	5.0	1.4	1.0	1.0	--	0.3	1.9	1.2	1.0	0.5
COC (TN)	5.6	3.7	3.2	1.5	2.1	2.6	4.8	2.4	1.7	2.6
FCF (GN)	--	--	--	--	--	--	--	--	--	--
FCF (TN)	--	--	--	--	--	--	--	--	0.1	0.1
FRD (GN)	9.0	11.2	7.7	17.8	6.3	6.7	10.0	7.0	9.9	3.5
FRD (TN)	0.4	0.9	0.7	1.0	0.3	1.2	0.2	0.5	0.5	0.7
GSF (GN)	--	--	--	--	--	--	--	--	--	--
GSF (TN)	--	--	--	--	0.3	--	--	0.1	0.1	0.1
HYB (GN)	--	--	--	--	--	--	--	--	--	--
HYB (TN)	--	--	--	0.2	--	--	--	--	--	0.1
LMB (GN)	--	--	--	--	--	--	--	--	--	--
LMB (TN)	0.2	0.7	--	0.5	0.3	0.1	0.2	1.6	--	--
NOP (GN)	0.2	0.2	0.2	--	--	0.5	0.6	0.5	0.3	1.2
NOP (TN)	0.2	0.1	0.2	0.5	0.3	0.5	0.2	0.4	0.1	0.2
OSF (GN)	--	--	--	--	--	--	--	--	--	--
OSF (TN)	--	--	--	--	--	--	0.1	--	--	--
RIC (GN)	--	--	--	--	--	--	0.1	--	--	--
RIC (TN)	--	--	--	--	--	--	--	--	--	--
SAR (GN)	--	--	--	--	--	--	--	--	0.1	--
SAR (TN)	--	--	--	--	--	--	--	--	--	--
SHR (GN)	1.5	7.0	9.7	9.5	20.0	9.3	6.0	7.7	0.3	0.2
SHR (TN)	4.4	21.9	12.2	9.5	5.6	6.8	10.2	3.3	2.9	1.7
SMB (GN)	--	0.2	--	--	0.3	--	--	--	--	--
SMB (TN)	0.6	0.2	0.3	0.4	0.6	0.1	0.3	0.3	--	0.5
WAE (GN)	1.7	2.0	1.7	3.0	3.3	1.8	1.1	2.0	1.0	2.7
WAE (TN)	0.6	1.8	0.7	0.9	--	0.4	0.4	--	0.4	0.6
WHC (TN)	2.1	0.7	0.4	0.5	--	0.1	--	0.2	0.3	--
WHC (GN)	0.5	--	0.2	0.2	0.3	0.2	--	--	--	--
WHS (GN)	--	--	0.3	0.2	--	0.8	0.8	1.2	0.3	0.5
WHS (TN)	0.2	0.7	0.1	0.6	0.3	0.1	0.6	0.1	0.3	0.1
YEP (GN)	--	0.2	--	--	--	--	--	--	--	--
YEP (TN)	--	--	--	--	--	--	--	--	--	--

BIB (Bigmouth Buffalo), BLB (Black Bullhead), BLC (Black Crappie), BLG (Bluegill), CCF (Channel Catfish), COC (Common Carp), FCF (Flathead Catfish), FRD (Freshwater Drum), GSF (Green Sunfish), HYB (Hybrid Sunfish), LMB (Largemouth Bass), NOP (Northern Pike), OSF (Orange-spotted Sunfish), RIC (River Carpsucker), SAR (Sauger), SHR (Shorthead Redhorse), SMB (Smallmouth Bass), WAE (Walleye), WHC (White Crappie), WHS (White Sucker), YEP (Yellow Perch)

MANAGEMENT RECOMMENDATIONS

1. Monitor the Lake Mitchell fishery with annual netting surveys to sample the general fish population and biennial electrofishing surveys to sample the bass population.
2. Work with the city of Mitchell and local sportsmen to preserve and enhance water quality and aquatic habitat.
3. Stock OTC-marked walleye fingerlings every other year in an attempt to accomplish the management objective. Conduct fall electrofishing surveys annually to evaluate contributions of stocked and naturally-produced fish to the fishery.

Table 9. Stocking record for Lake Mitchell, Davison County, 1991-2008.

Year	Number	Species	Size
1991	67,000	Saugeye	Fingerling
1992	35,000	Largemouth Bass	Fingerling
	67,000	Saugeye	Fingerling
	35,000	Smallmouth Bass	Fingerling
1993	82,900	White Crappie	Fingerling
	70,000	Walleye	Fingerling
	67,200	Smallmouth Bass	Fingerling
1994	13,125	Channel Catfish	Fingerling
1995	12,438	Black Crappie	Adult
	67,000	Walleye	Fingerling
1996	22,746	Black Crappie	Fingerling
	3,198	Black Crappie	Adult
	42,500	Smallmouth Bass	Fingerling
1997	254,205	Walleye	Fingerling
1999	73,700	Walleye	Fingerling
	13,850	Walleye	Large Fingerling
2003	20,640	Black Crappie	Fingerling
2006	67,760	Walleye	Fingerling
2007	5,192	Walleye	Large Fingerling

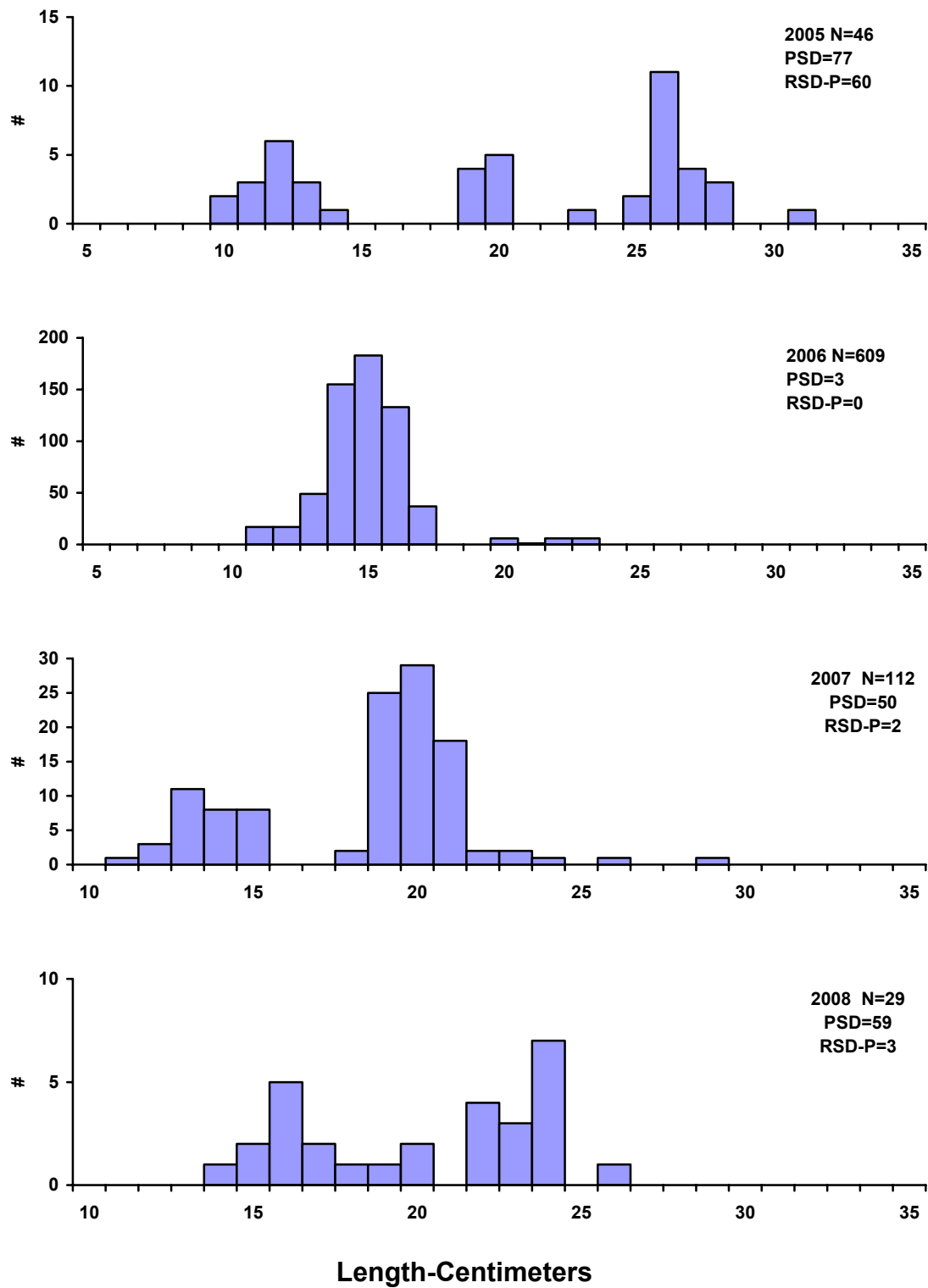


Figure 1. Length frequency histograms for black crappies sampled with trap nets in Lake Mitchell, Davison County, 2005-2008.

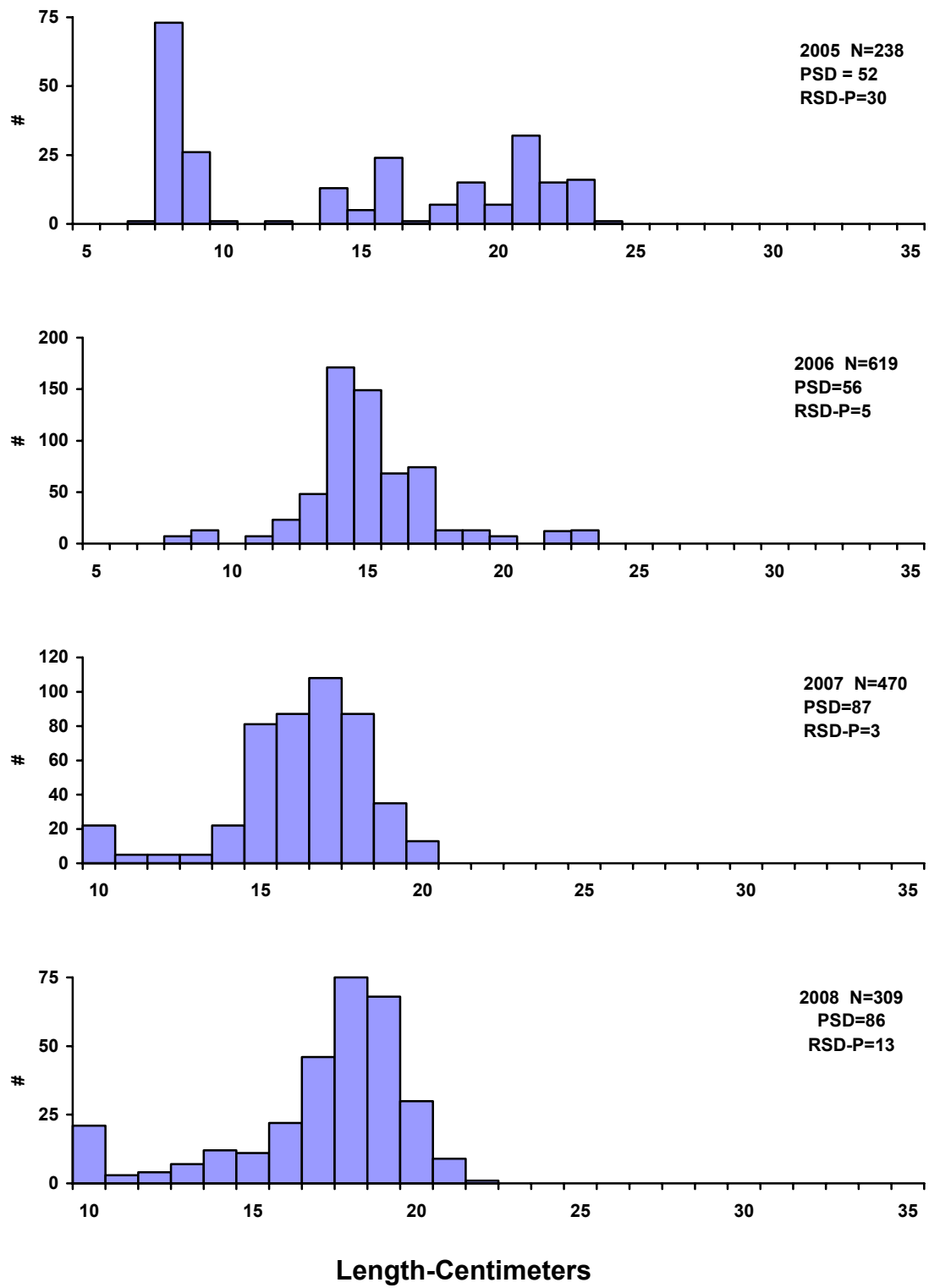
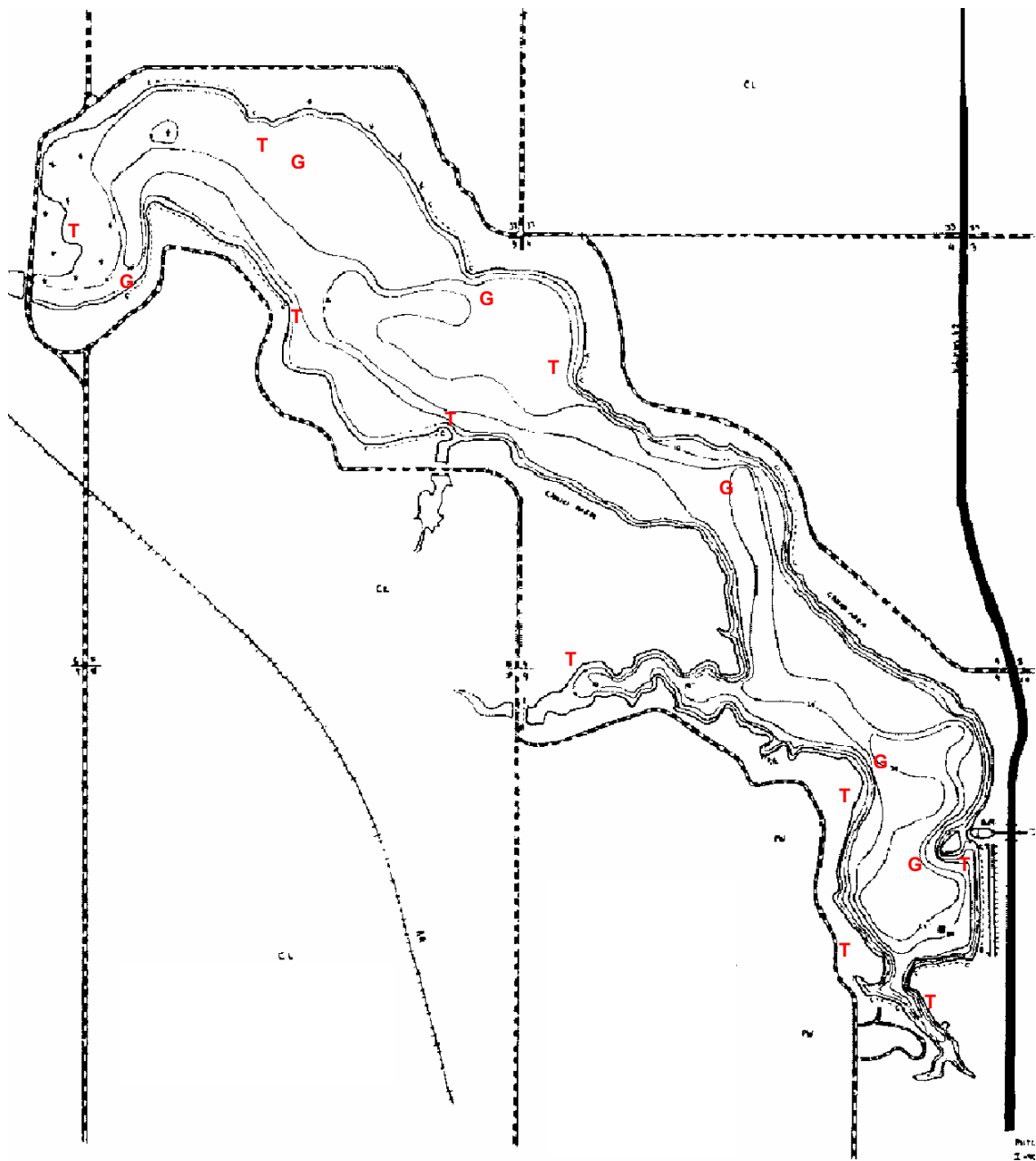


Figure 2. Length frequency histograms for bluegill sampled with trap nets in Lake Mitchell, Davison County, 2005-2008.



Legend
Gill Nets: G
Trap Nets: T

Figure 3. Sampling locations on Lake Mitchell, Davison County, 2008.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$\text{PSD} = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$\text{RSD-P} = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.